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(54) Focus traversal mechanism for graphical user interface widgets

(57) Selectively determining a particular graphical user interface widget to receive focus base upon user-entered directional information. When a user enters information concerning which direction to move the focus

of the widgets, such as by manipulating arrow keys, the system uses geometry of a current widget and other visible traversable widgets in combination with the user-entered information to determine the next widget, and it moves the focus to that widget.

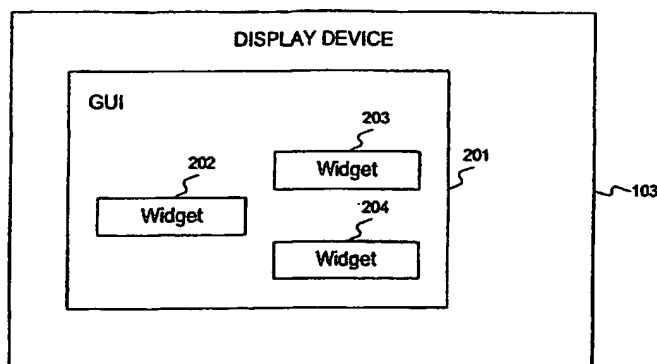


FIG. 2

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**Description****FIELD OF THE INVENTION**

5 [0001] The present invention relates to an apparatus and methods for selecting graphical user interface (GUI) widgets based upon user-entered information.

**BACKGROUND OF THE INVENTION**

10 [0002] Many devices include GUIs presenting widgets. A "widget" refers to a screen element or a video display. The GUIs may illustrate focus for a particular one of the widgets, indicating that the widget has been selected. "Focus" refers to any visual information distinguishing one displayed widget from other displayed widgets, and all events from an input device are typically directed to a currently focused widget. For example, the device may highlight the selected widget on the GUI or display it in a different color compared with the other displayed widgets. Users may select widgets using a pointing device, such as "mouse," to move a cursor to a particular widget and "click on" the widget to select it. These pointing devices thus allow direct selection of widgets.

15 [0003] Not all devices with GUIs, however, include associated pointing devices. For example, set-top boxes for televisions typically include only the box and a keyboard. In order for a user to select a widget displayed on an associated television, the user must use keys on the keyboard, such as arrow keys, to move focus from one widget to the next. A system controlling the focus of the widgets thus must interpret those directional commands from the arrow keys in order to determine the next widget to receive focus. Determining which widget to receive focus is further complicated when many widgets are displayed and potentially overlapping one another.

20 [0004] Accordingly, a need exists for a system and method to determine which widget will receive focus based upon user-entered directional information in order to effect a visually appealing interaction with the GUI.

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**BRIEF DESCRIPTION OF THE DRAWINGS**

[0005] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate an implementation of the invention and, together with the description, serve to explain the advantages and principles of the invention. In the drawings,

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FIG. 1 depicts a data processing system suitable for practicing methods and systems consistent with the present invention;

FIG. 2 depicts an exemplary GUI in the data processing system shown in FIG. 1;

35 FIG. 3 is an example of a user interface illustrating operation of an embodiment consistent with the present invention; and

FIGS. 4A-4F are a flow chart illustrating exemplary processing associated with the user interface shown in FIG. 3.

**SUMMARY OF THE INVENTION**

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[0006] Apparatus and methods consistent with the present invention determine which widget among a plurality of widgets displayed on a GUI will receive focus based upon user-entered information concerning a direction in which to move the focus and positional information relative to the displayed widgets.

45 [0007] A method consistent with the present invention includes receiving user-entered directional information in a data processing system having a display device displaying a plurality of widgets. The method also includes determining a selected one of the widgets to be displayed with focus based upon the user-entered directional information and positional information for each of the displayed widgets, and information for use in displaying the selected widget with focus is transmitted to a system controlling the display device.

50 [0008] An apparatus consistent with the present invention receives user-entered directional information in a data processing system having a display device displaying a plurality of widgets. The apparatus determines a selected one of the widgets to be displayed with focus based upon the user-entered directional information and positional information for each of the displayed widgets and information for use in displaying the selected widget with focus is transmitted to a system controlling the display device.

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**DETAILED DESCRIPTION**

[0009] Apparatus and methods consistent with the present invention determine which widget among a plurality of widgets displayed on a GUI will receive focus based upon user-entered information concerning a direction in which to

move the focus and positional information relative to all of the displayed widgets. This determination helps promote a user-friendly and visually appealing interaction by a user, since the focus moves among widgets in a consistent manner.

#### Focus Traversal System

**[0010]** FIG. 1 depicts a data processing system 100 suitable for practicing methods and systems consistent with the present invention. Data processing system 100 includes an exemplary information appliance 101 optionally connected to a network 107, such as the Internet. "Information appliance" refers to devices incorporating a GUI but not necessarily having an associated pointing device other than directional keys. Examples of information appliances include, but are not limited to, the following devices: a television set-top box; an e-mail device; an electronic address book; an electronic personal organizer; and a smart telephone.

**[0011]** Information appliance 101 includes a memory 102, a secondary storage device 104, a processor 105 such as a central processing unit, an input device 106, and a display device 103. Memory 102 and secondary storage 104 may store applications or information for execution and use by processor 105.

**[0012]** Memory 102 stores a widget list 108 and parameters 109 for use in determining a selected widget. A widget list stores an identification of each of the displayed widgets and information identifying a location of the corresponding widgets on the display device, and the widget list is updated periodically in response to an application using it. Database structures other than a list may also be used to store such information. The values of parameters 109, explained below, are used in processing for determining a selected widget. Memory 102 also stores, for example, an application 110 using widget list 108 and parameters 109 for use in determining a selected widget to be displayed with focus.

**[0013]** Input device 106 may be used to enter directional information and possibly other information. Input device 106 does not necessarily include a pointing device for direct selection of a widget. Therefore, a system, such as application 110 controlling processor 105, determines which widget is selected on display device 103 based upon user-entered directional information. Even if input device 106 does contain a pointing device, a user may instead choose to use, for example, arrow keys to traverse widgets, in which case the system also determines a selected widget based upon user-entered directional information. Input device 106 transmits the directional information to information appliance 101 along a connection, which may include a wireline connection or a wireless connection such as use of infrared light signals.

**[0014]** Input device 106 includes a mechanism to receive directional information from a user. "Directional information" refers to information providing an indication of intended movement of focus among widgets in a particular direction. Such a mechanism may include directional keys like arrow keys. Arrow keys may include right and left arrow keys for entering information indicating movement in a horizontal direction and up and down arrow keys for entering information indicating movement in a vertical direction. Other mechanisms may receive directional information, for example, a voice-activated input receiving voice commands such as up, down, right, or left.

**[0015]** Although information appliance 101 is depicted with various components, one skilled in the art will appreciate that this appliance can contain additional or different components. Additionally, although information appliance 101 is shown connected to network 107, information appliance 101 may be connected to other networks, including other wide area networks or local area networks. Furthermore, although aspects of the present invention are described as being stored in memory, one skilled in the art will appreciate that these aspects can also be stored on or read from other types of computer program products or computer-readable media, such as secondary storage devices, including hard disks, floppy disks, or CD-ROM; a carrier wave from a network such as the Internet; or other forms of RAM or ROM. These aspects of the present invention may also include modules, implemented in software, hardware, or a combination, configured to perform a particular method implementing an embodiment consistent with the present invention. In addition, the computer-readable media may include instructions for controlling a computer system, such as information appliance 101, to perform a particular method.

**[0016]** FIG. 2 depicts an exemplary GUI 201 for displaying widgets, such as widgets 202, 203 and 204, on display device 103. Only three widgets are shown for exemplary purposes; a GUI may display more or fewer widgets and may display them overlapping one another or hidden from view. When information appliance 101 receives directional information from a user through input device 106, a system within the appliance determines which widget is to receive focus. This system may be implemented in an application, such as application 110, or in a layer between an application and an operating system. If widget 202 is the current widget, for example, meaning it is currently shown with focus, and a user selects a right arrow key on input device 106, the system determines whether widget 203 or 204 will next receive focus, even though both are displayed to the right of widget 202.

**[0017]** The system makes the determination in such a manner as to facilitate a visually appealing interaction with the user. In particular, the system compares the location of the current widget with the location of each of the other focus traversable widgets, using the top-left corner of each widget as a reference point. The phrase "focus traversable" means that the widget is capability of being displayed with focus. For movement in a vertical direction, the system selects as the next currently focused widget the widget with minimum horizontal distance and minimum vertical distance

from the current widget in the direction of movement.

[0018] For movement in a horizontal direction the system processes the vertical distance between the current widget and the other focus traversable widgets, and it also processes the horizontal distance from the current widget. In particular, the system selects the closest widget at the same horizon as the current widget in the direction of movement; if no widget is on the same horizon, it selects the widget with the closest vertical and horizontal distance in the direction of movement, similar to the determination for vertical movement. The phrase "same horizon" refer to the same horizontal position on a display device. Although the system uses the top-left corner as a reference point, it may alternatively use a different reference point for the widgets, such as a different corner or the center of each widget.

#### Focus Traversal GUI

[0019] FIG. 3 is an example of a user interface 300 illustrating operation of an embodiment consistent with the present invention. This exemplary user interface may correspond to GUI 201 presented on display device 103 under control of processor 105. The buttons in user interface 300 are examples of widgets. The arrows between the buttons represent traversal of focus of the buttons in response to particular arrow key inputs. The system may receive these key inputs from input device 106. FIG. 3 includes for illustrative purposes some of the possible traversals between buttons, and other traversals are possible.

[0020] Lines 301 and 302 represent traversal of focus in response to down arrow key inputs, in which case focus traverses from button 3 to button 6 (line 301) and then from button 6 to button 8 (line 302). Likewise, lines 305 and 306 represent traversal of focus from button 2 to button 5 (line 305) and from button 5 to button 7 (line 306) in response to down arrow key inputs.

[0021] Lines 303 and 304 represent traversal of focus in response to up arrow key inputs, in which case focus traverses from button 8 to button 6 (line 303) and then from button 6 to button 3 (line 304). Likewise, lines 307 and 308 represent traversal of focus from button 7 to button 4 (line 307) and from button 4 to button 1 (line 308) in response to up arrow key inputs. Although a down arrow key input moved focus from button 5 to button 7, an up arrow key input in comparison moves focus from button 7 to button 4. Buttons 4 and 5 are both the same distance above button 7, but button 4 is considered closer because its reference point (the top-left corner in this example) has a shorter horizontal distance to the reference point for button 7.

[0022] Lines 309 and 310 represent traversal of focus in response to left arrow key inputs, in which case focus traverses from button 6 to button 5 (line 309) and then from button 5 to button 4 (line 310). Likewise, line 314 represents traversal of focus from button 8 to button 7 in response to a left arrow key input. With focus on button 7, a left arrow key input results in focus moving to button 4, as represented by line 315. Since no widget is on the same horizon as button 7 to the left of the button, focus moves to the widget with the closest vertical and horizontal distance from button 7 in the direction of movement, in this example button 4.

[0023] Lines 311 and 312 represent traversal of focus in response to right arrow key inputs, in which case focus traverses from button 4 to button 5 (line 311) and then from button 5 to button 6 (line 312). With focus on button 6, a right arrow key input results in focus moving to button 3, as represented by line 313. Since no widget is on the same horizon as button 6 to the right of the button, focus moves to the widget with the closest vertical and horizontal distance from button 6 in the direction of movement, in this example button 3. With focus on button 3, a right arrow key input results in no change, as no button is displayed to the right to button 3. Alternatively, the system may include a wrap-around feature, in which the edges of the GUI are considered to "wrap-around." With a wrap-round feature, focus moves from button 3 to button 4 in response to a right arrow key input; if the edges are considered to wrap-around, then button 4 is closest to button 3 in the direction of movement and wrapping around the right edge of the GUI.

#### Focus Traversal Processing

[0024] FIGS. 4A-4F are a flow chart illustrating an exemplary process 400 associated with the user interface shown in FIG. 3. This processing may be implemented in software, such as application 110, stored in memory 102 or secondary storage 104 for controlling operation of processor 105. These flow charts illustrate an example of a method for implementing the principles of widget selection identified above, and other methods are possible for implementing those principles.

[0025] In process 400, the system first performs initialization steps. In particular, it initializes parameters 109 used by the process (step 401) and retrieves widget list 108 (step 402). These exemplary parameters include the following: a current widget ("currWidget") parameter used to identify a currently focused widget; closestX and closestY parameters used to determine a widget that is closest horizontally and vertically, respectively, to a currently focused widget; a closestDistance parameter defined by the sum of the closestX and closestY parameters used to determine a widget closest in combined horizontal and vertical directions to a currently focused widget; a focusRecipient parameter used to identify the next widget to receive focus; a keyInput parameter representing the user-entered directional information;

and a widgetList parameter representing widget list 108. The system also initializes the anchor parameters (anchorX and anchorY), used to identify a location on the GUI of a widget receiving focus when a user entered a command to move focus to another widget.

[0026] The system determines if the current widget is null, meaning that no widget currently receives focus and no widgets are in widget list 108 (step 403), which may result, for example, if no focusable widgets are displayed. If the current widget is null, the system initializes the anchor points to zero (step 405); otherwise, it initializes the anchor points to the top-left position of the current widget (step 404). Initialization also involves determining if the current widget is at the end of widget list 108 (step 406). If the current widget is at the end of widget list 108, the system returns an indication to apply focus to the current widget, using the focusRecipient parameter, and thus display it as the selected widget (step 407). For example, a value of the focusRecipient parameter is transmitted to a system controlling display device 103, such as processor 105 operating under control of an application or operating system.

[0027] Otherwise, the system recursively processes the component widgets in order to identify the selected widget to receive focus (step 408). A "component" refers to a window or section of a GUI, and the component widgets are those widgets displayed at least partially within the window or section. The system selects from widget list 108 a widget to process, referred to as this Widget. The system determines if this Widget is visible, enabled, and focus traversable (step 409), and if not, it returns to step 406 to select another widget from widget list 108. Otherwise, the system determines if this Widget is the same as the current widget (step 410 in FIG. 4B), and if so, it also returns to step 406.

[0028] If this Widget is visible, enabled, and focus traversable, and if it is not the same as the current widget, then the system determines the distance between this Widget and the current widget (step 411). It determines locations of the top-left corner of this Widget, referred to as widgetX and widgetY parameters, and it calculates the absolute values between those parameters and the anchor points, producing deltaX and deltaY values representing the distances between the top-left corners of this Widget and the current widget.

[0029] The system then determines which command the user selected in order to move focus to another widget, and in this example those commands involve use of arrow keys on input device 106. In steps 412-415, the system determines if the user selected a left arrow key, an up arrow key, a down arrow key, or a right arrow key. Alternatively, the system may receive directional inputs from other sources on input devices 106. If none of those keys were selected, the system returns "NULL" to indicate no change in focus (step 416).

[0030] If the user selected the left arrow key (step 412), the system performs steps 417-421. It determines if this Widget is displayed to the left of the current widget (step 417 in FIG. 4C). If not, it returns to step 406 to obtain another widget from widget list 108. If this Widget is displayed to the left of the current widget, the system determines if the widget is closer horizontally to the current widget than the previously processed widget by comparing values of the closestX and closestY parameters with values of the deltaX and deltaY parameters (step 418). If this Widget is closer horizontally, the system sets the focusRecipient parameter to this Widget (step 419). If the widget is not closer, the system determines if this Widget is closer vertically to the current widget than the previously processed widget (step 420). If it is closer vertically, the system sets the focusRecipient parameter to this Widget (step 421). The system then returns to step 406 to obtain another widget for processing, if necessary. Therefore, the system iteratively executes steps 417-421 to determine the next widget to receive focus in response to selection of the left arrow key.

[0031] If the user selected the up arrow key (step 413), the system performs steps 422-425. The system first determines if this Widget is displayed above the current widget by comparing the values of the widgetY parameter and the anchorY parameter (step 422 in FIG. 4D). If this Widget is not displayed above the current widget, the system returns to step 406 to obtain another widget from widget list 108 for processing. Otherwise, the system sets a distance parameter by adding the values of the deltaX and deltaY parameters (step 423), and it determines if this Widget is the closest widget to the current widget by comparing the value of the combined horizontal and vertical distances with the value of the closestDistance parameter (step 424). If this Widget is the closest widget, the system sets the focusRecipient parameter to this Widget and sets the closestDistance parameter to the value of the combined horizontal and vertical distances (step 425). The system then returns to step 406 to obtain another widget for processing, if necessary. Therefore, the system iteratively executes steps 422-425 to determine the next widget to receive focus in response to selection of the up arrow key.

[0032] If the user selected the down arrow key (step 414), the system performs steps 426-429. The system first determines if this Widget is displayed below the current widget by comparing the values of the widgetY parameter and the anchorY parameter (step 426 in FIG. 4E). If this Widget is not displayed below the current widget, the system returns to step 406 to obtain another widget from widget list 108 for processing. Otherwise, the system sets a distance parameter by adding the values of the deltaX and deltaY parameters (step 427), and it determines if this Widget is the closest widget to the current widget by comparing the value of the combined horizontal and vertical distances with the value of the closestDistance parameter (step 428). If this Widget is the closest widget, the system sets the focusRecipient parameter to this Widget and sets the closestDistance parameter to the value of the combined horizontal and vertical distances (step 429). The system then returns to step 406 to obtain another widget for processing, if necessary. Therefore, the system iteratively executes steps 426-429 to determine the next widget to receive focus in response to

selection of the down arrow key.

[0033] If the user selected the right arrow key (step 415), the system performs steps 430-434. It determines if this Widget is displayed to the right of the current widget (step 430 in FIG. 4F). If not, it returns to step 406 to obtain another widget from widget list 108. If this Widget is displayed to the right of the current widget, the system determines if this Widget is closer horizontally to the current widget than the previously processed widget by comparing values of the closestX and closestY parameters with values of the deltaX and deltaY parameters (step 431). If the widget is closer horizontally, the system sets the focusRecipient parameter to this Widget (step 432). If this Widget is not closer, the system determines if this Widget is closer vertically to the current widget than the previously processed widget (step 433). If it is closer vertically, the system sets the focusRecipient parameter to this Widget (step 434). The system then returns to step 406 to obtain another widget for processing, if necessary. Therefore, the system iteratively executes steps 430-434 to determine the next widget to receive focus in response to selection of the left right key.

[0034] Table I includes an exemplary pseudo code listing for implementing an embodiment for determining selected widgets consistent with the present invention. An application implementing this exemplary pseudo code may be stored in memory 102 or secondary storage 104 for execution by processor 105.

Table I

5	1) Initializations initialize closestX, closestY, closestDistance to very large values initialize nextWidget to NULL
10	2) Get the current anchor point and get the Cursor key input currWidget = getCurrWidget ( widgetList ) keyInput = getKeyInput ( )
15	3) if the current widget is not NULL, use its top-left corner as the anchor, else initialize anchor to a default value
20	if (currentWidget != NULL) anchorX = LEFT (currentWidget) anchorY = TOP (currentWidget) else anchorX = default value (say 0) anchorY = default value (say 0)
25	4) Iterate through each widget in the widgetList
30	4.1) Recurse through container widgets until a component widget is reached thisWidget = recurse ( widgetList )
35	4.2) skip if thisWidget is not visible, enabled, and focus-traversable
40	4.3) skip if currentWidget is same as thisWidget if (currentWidget == thisWidget) continue
45	4.4) get this widgets top-left corner point widgetX = LEFT (thisWidget) widgetY = TOP (thisWidget)
50	4.5) compute vertical and horizontal distances between top-left corners of currentWidget and thisWidget deltaX = abs (widgetX - anchorX) deltaY = abs (widgetY - anchorY)
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4.6)  if RIGHT move
        if keyInput is right arrow key

5      4.6.1) if this widget is on the right of current widget and below or at par with current widget.
           if (widgetX > anchorX && widgetY ==> anchorY)

           if this widget is vertically as close as previous marked next widget and if it is
10          horizontally closer to the current widget
           if ( deltaY == closestY && deltaX < closestX)

           change closestX to deltaX
           closestX = deltaX
15          mark this widget as next widget
           nextWidget = thisWidget

           else if this widget is vertically closer than the previously marked next widget
20          else if (deltaY < closestY)

           change closestX to deltaX
           closestX = deltaX
           change closestY to deltaY
           closestY = deltaY
25          mark this widget as next widget
           nextWidget = thisWidget

30      ELSE if LEFT move
           if keyInput is left arrow key
           if this widget is on the left of current widget and above or at par with current widget.
           if (widgetX < anchorX && widgetY <= anchorY)
35          if this widget is vertically as close as previous marked next widget and if it
           is horizontally closer to the current widget
           if ( deltaY == closestY && deltaX < closestX)

40          change closestX to deltaX
           closestX = deltaX
           mark this widget as next widget
           nextWidget = thisWidget
45          else if this widget is vertically closer than the previously marked next
           widget
           else if ( deltaY < closestY)
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change closestX to deltaX
closest X = deltaX
change closestY to deltaY
closest Y = deltaY
mark this widget as next widget
nextWidget = thisWidget

ELSE if UP move
    if keyInput is up arrow key
    if this widget is above the current widget.
        if (widgetY < anchorY)

        if this widget is horizontally and vertically closer to current widget than
        the previously marked widget

        if ( deltaY + deltaX < closestDistance)

            change closestDistance to deltaX + deltaY
            closestDistance = deltaX + deltaY
            mark this widget as next widget
            nextWidget = thisWidget

ELSE if DOWN move
    if keyInput is down arrow key
    if this widget is below the current widget.
        if (widgetY > anchorY)

        if this widget is horizontally and vertically closer to current widget than
        the previously marked widget

        if ( deltaY + deltaX < closestDistance)

            change closestDistance to deltaX + deltaY
            closestDistance = deltaX + deltaY
            mark this widget as next widget
            nextWidget = thisWidget

return next widget.

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[0035] While the present invention has been described in connection with a preferred embodiment, many modifications will be readily apparent to those skilled in the art, and this application is intended to cover any adaptations or variations thereof. For example, different reference points on the widgets, different parameters, different types of GUIs, and varying types of input devices for entering directional information, may be used without departing from the scope of the invention. This invention is limited only by the claims and equivalents thereof.

**Claims**

1. A method in a data processing system having a display device displaying a plurality of widgets, comprising:
  - receiving user-entered directional information;
  - determining a selected one of the widgets to be displayed with focus based upon the user entered directional information and positional information for each of the displayed widgets; and
  - transmitting information for use in displaying the selected widget with focus.
2. The method of claim 1 wherein the transmitting includes transmitting the information to a system controlling the display device.
3. The method of claim 1 wherein the receiving includes receiving the user-entered directional information in response to an arrow key input on an input device.
4. The method of claim 1 wherein the determining includes determining, in response to a request for movement of focus in a vertical direction, a displayed one of the widgets having a minimum vertical distance and a minimum horizontal distance from a currently focused widget in a direction of the requested movement.
5. The method of claim 1 wherein the determining includes determining, in response to a request for movement of focus in a horizontal direction, a displayed one of the widgets having a minimum horizontal distance from a currently focussed widget in a direction of the requested movement and on a same horizon as the currently focused widget.
6. The method of claim 5 wherein the determining includes determining, if no widget is on the same horizon in the direction of the requested movement, a displayed one of the widgets having a minimum vertical distance and a minimum horizontal distance from the currently focused widget in a direction of the requested movement.
7. The method of claim 1 wherein the determining includes:
  - identifying a reference point for each of the widgets; and
  - comparing distances between the widgets using the reference points.
8. The method of claim 1 wherein the determining includes accessing a widget list storing an identification of each of the displayed widgets and storing information identifying a location of the corresponding widget on the display device.
9. An apparatus in a data processing system having a display device displaying a plurality widgets, comprising:
  - a module configured to receive user-entered directional information;
  - a module configured to determine a selected one of the widgets to be displayed with focus based upon the user-entered directional information and positional information for each of the displayed widgets; and
  - a module configured to transmit information for use in displaying the selected widget with focus.
10. The apparatus of claim 9 wherein the transmit module includes a module configured to transmit the information to a system controlling the display device.
11. The apparatus of claim 9 wherein the receive module includes a module configured to receive the user-entered directional information in response to an arrow key input on an input device.
12. The apparatus of claim 9 wherein the determine module includes a module configured to determine, in response to a request for movement of focus in a vertical direction, a displayed one of the widgets having a minimum vertical distance and a minimum horizontal distance from a currently focused widget in a direction of the requested movement.

13. The apparatus of claim 9 wherein the determine module includes  
a module configured to determine, in response to a request for movement of focus in a horizontal direction,  
a displayed one of the widgets having a minimum horizontal distance from a currently focussed widget in a direction  
of the requested movement and on a same horizon as the currently focused widget.
14. The apparatus of claim 13 wherein the determine module includes  
a module configured to determine, if no widget is on the same horizon in the direction of the requested  
movement, a displayed one of the widgets having a minimum vertical distance and a minimum horizontal distance  
from the currently focused widget in a direction of the requested movement.
15. The apparatus of claim 9 wherein the determine module includes:  
  
a module configured to identify a reference point for each of the widgets; and  
a module configured to compare distances between the widgets using the reference points.
16. The apparatus of claim 9 wherein the determine module includes  
a module configured to access a widget list storing an identification of each of the displayed widgets and  
storing information identifying a location of the corresponding widgets on the display device.
17. A computer program product, comprising:  
  
a computer-readable medium containing instructions for controlling a computer system having a display device  
displaying a plurality of widgets, the method including:  
receiving user-entered directional information;  
determining a selected one of the widgets to be displayed with focus based upon the user; entered directional  
information and positional information for each of the displayed widgets; and  
transmitting information for use in displaying the selected widget with focus.
18. The computer program product of claim 17 wherein the transmitting includes  
transmitting the information to a system controlling the display device.
19. The computer program product of claim 17 wherein the receiving includes  
receiving the user-entered directional information in response to an arrow key input on an input device.
20. The computer program product of claim 17 wherein the determining includes  
determining, in response to a request for movement of focus in a vertical direction, a displayed one of the  
widgets having a minimum vertical distance and a minimum horizontal distance from a currently focused widget  
in a direction of the requested movement.
21. The computer program product of claim 17 wherein the determining includes  
determining, in response to a request for movement of focus in a horizontal direction, a displayed one of the  
widgets having a minimum horizontal distance from a currently focussed widget in a direction of the requested  
movement and on a same horizon as the currently focused widget.
22. The computer program product of claim 21 wherein the determining includes  
determining, if no widget is on the same horizon in the direction of the requested movement, a displayed one  
of the widgets having a minimum vertical distance and a minimum horizontal distance from the currently focused  
widget in a direction of the requested movement.
23. The computer program product of claim 17 wherein the determining includes:  
  
identifying a reference point for each of the widgets; and  
comparing distances between the widgets using the reference points.
24. The computer program product of claim 17 wherein the determining includes  
accessing a widget list storing an identification of each of the displayed widgets and storing information  
identifying a location of the corresponding widgets on the display device.

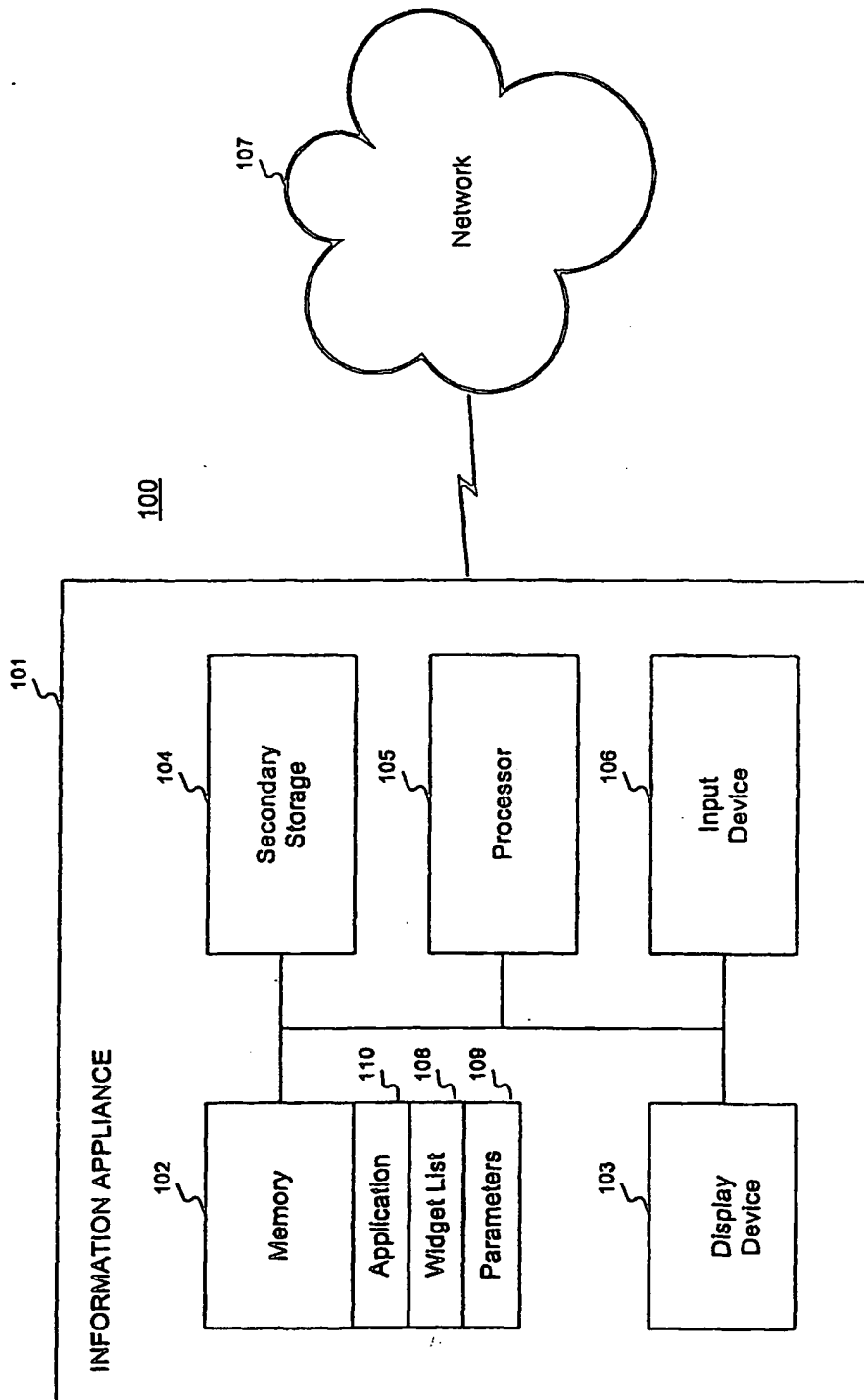


FIG. 1

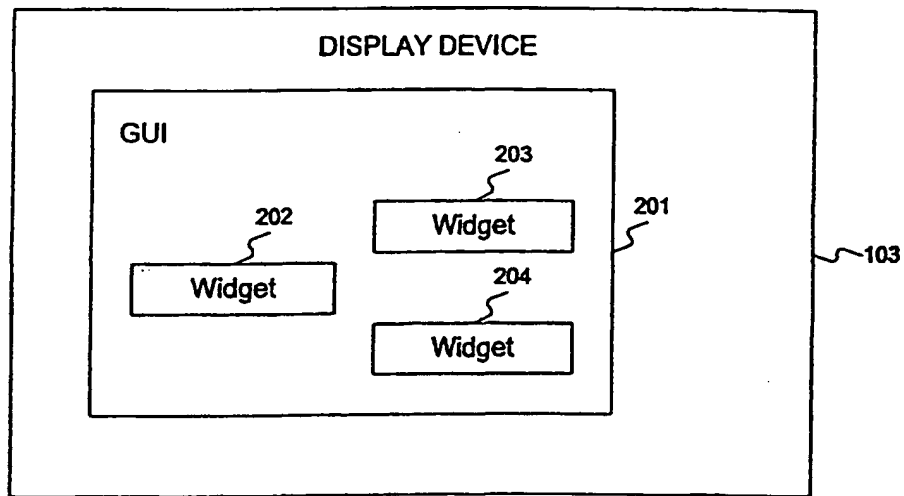


FIG. 2

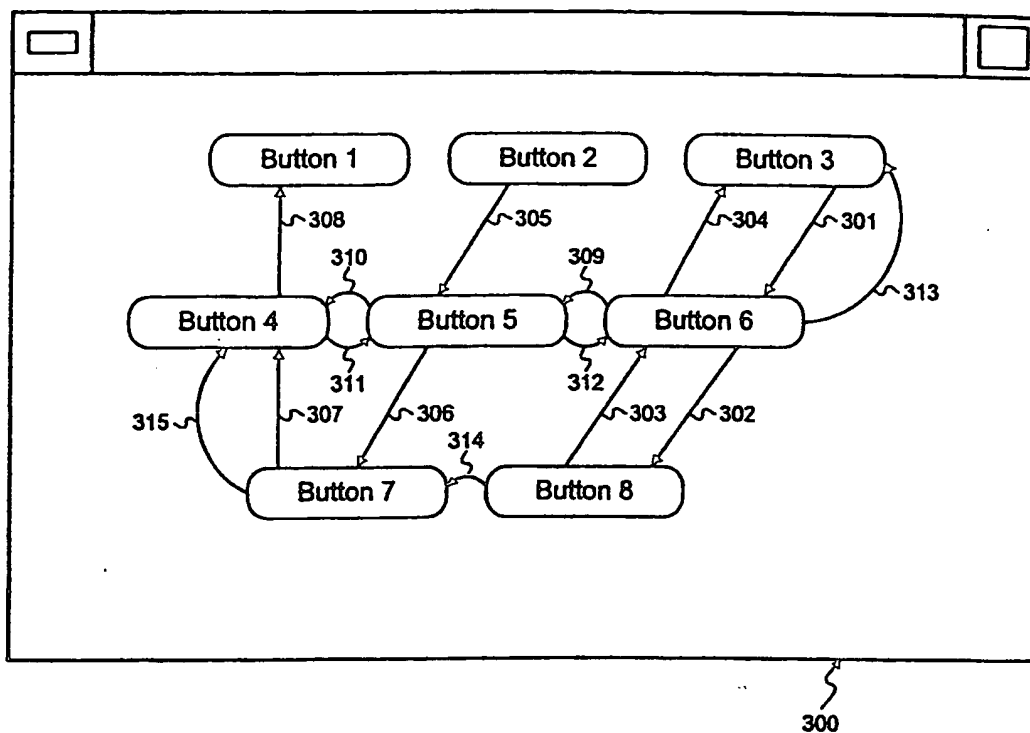


FIG. 3

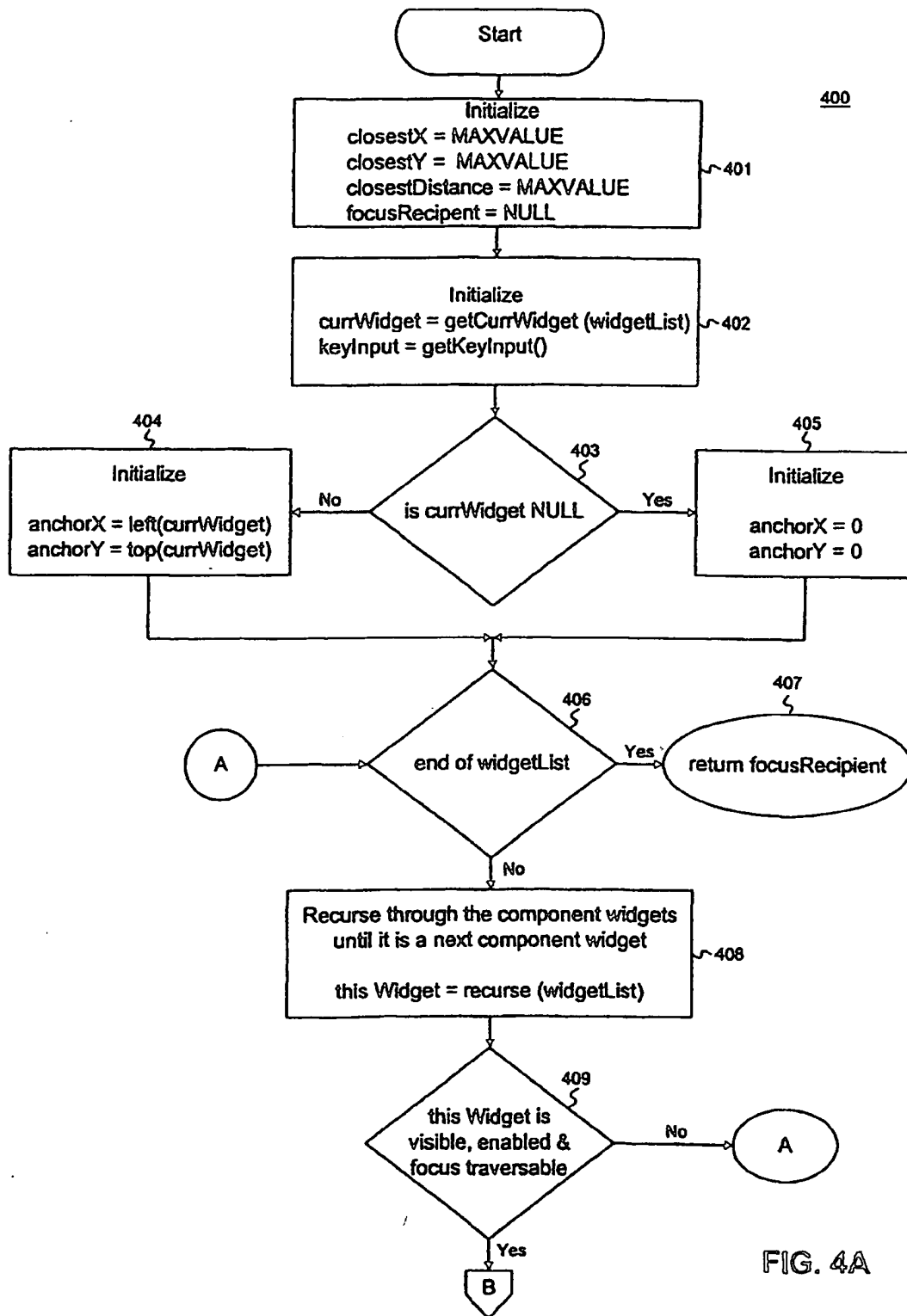


FIG. 4A

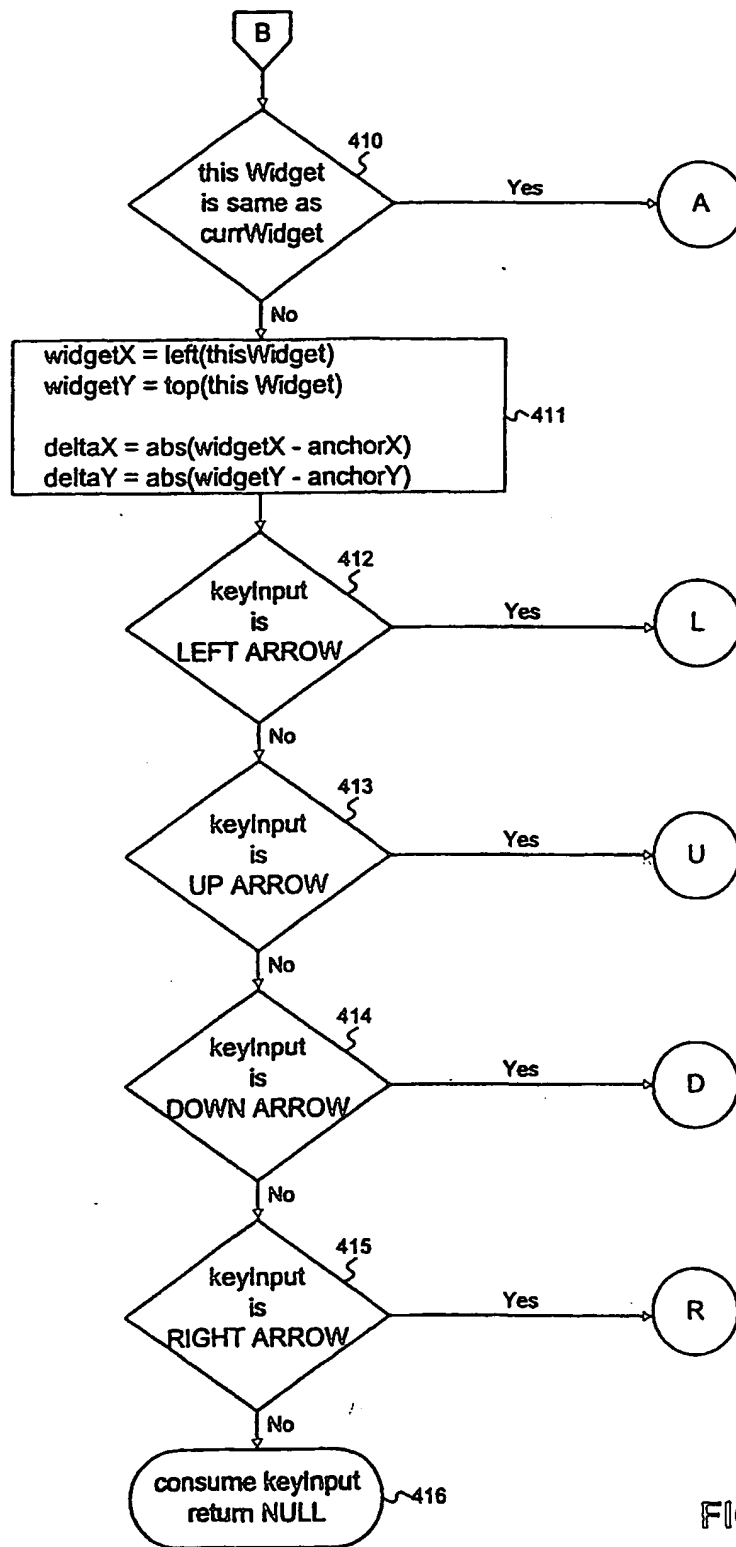


FIG. 48



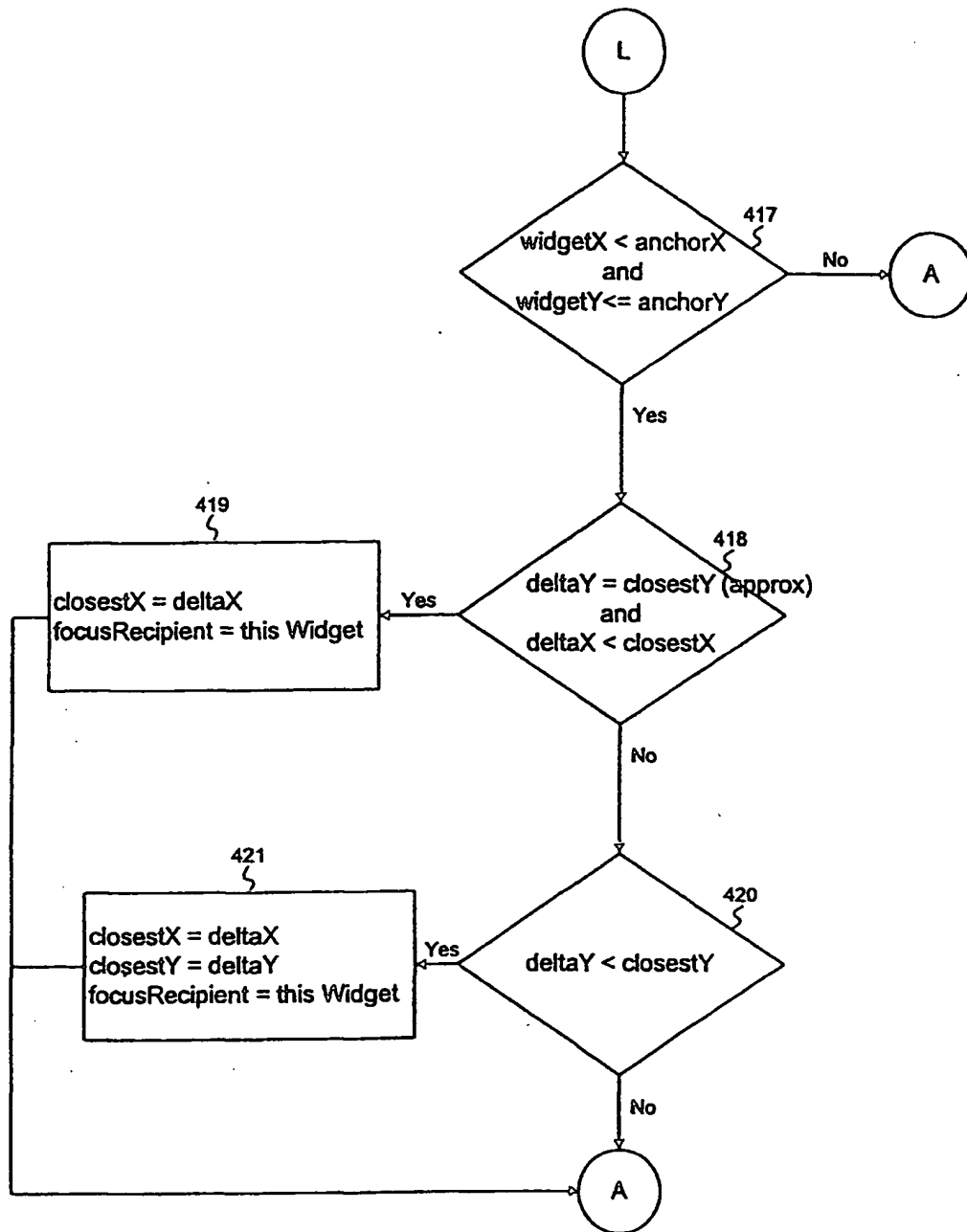


FIG. 4C

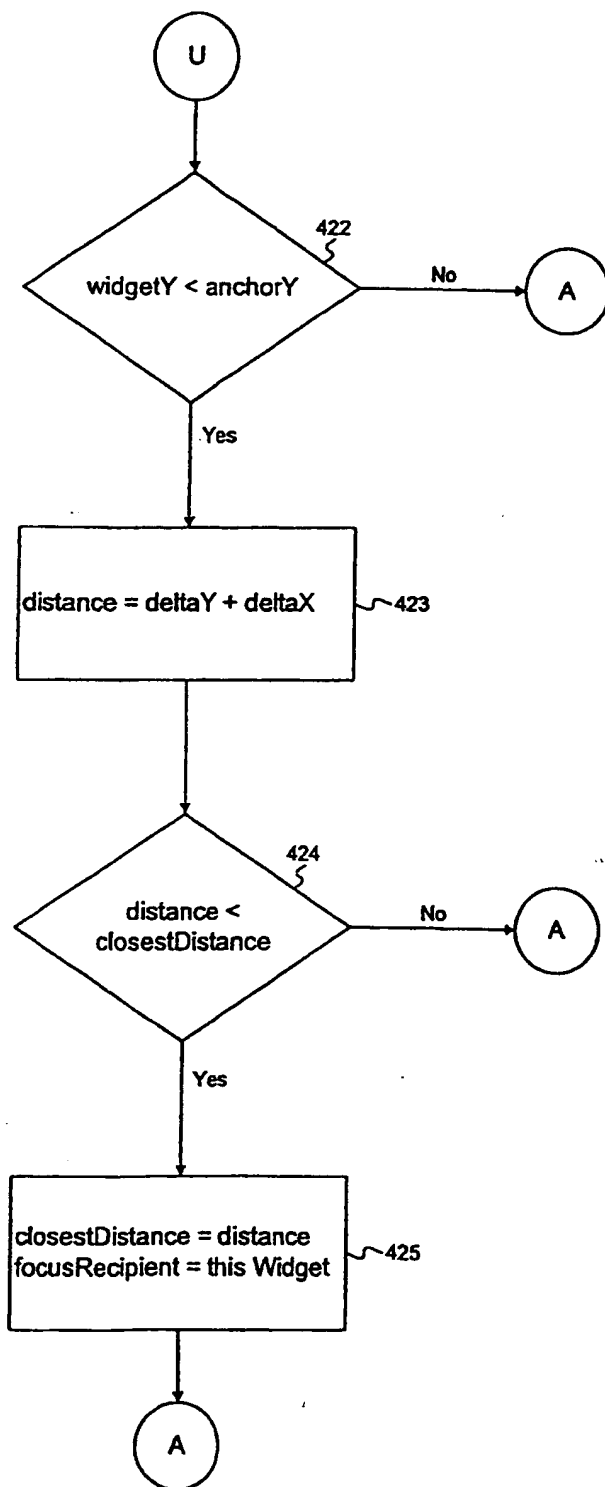


FIG. 4D

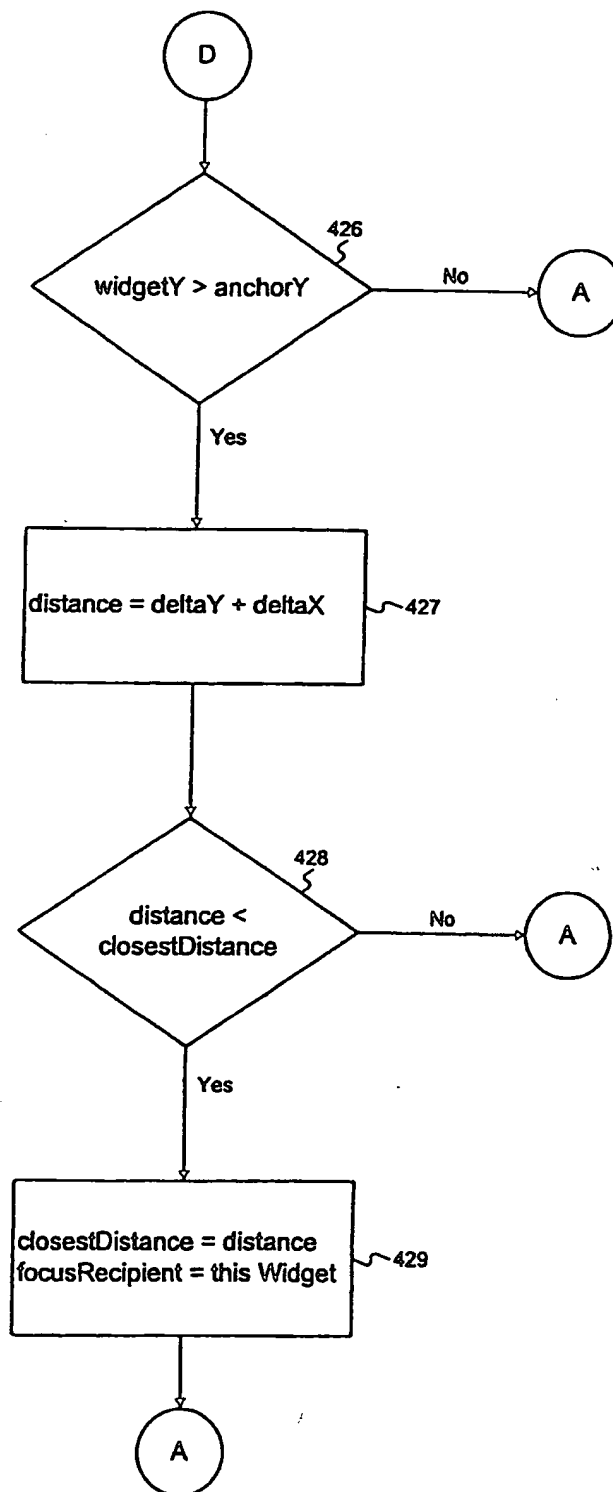


FIG. 4E

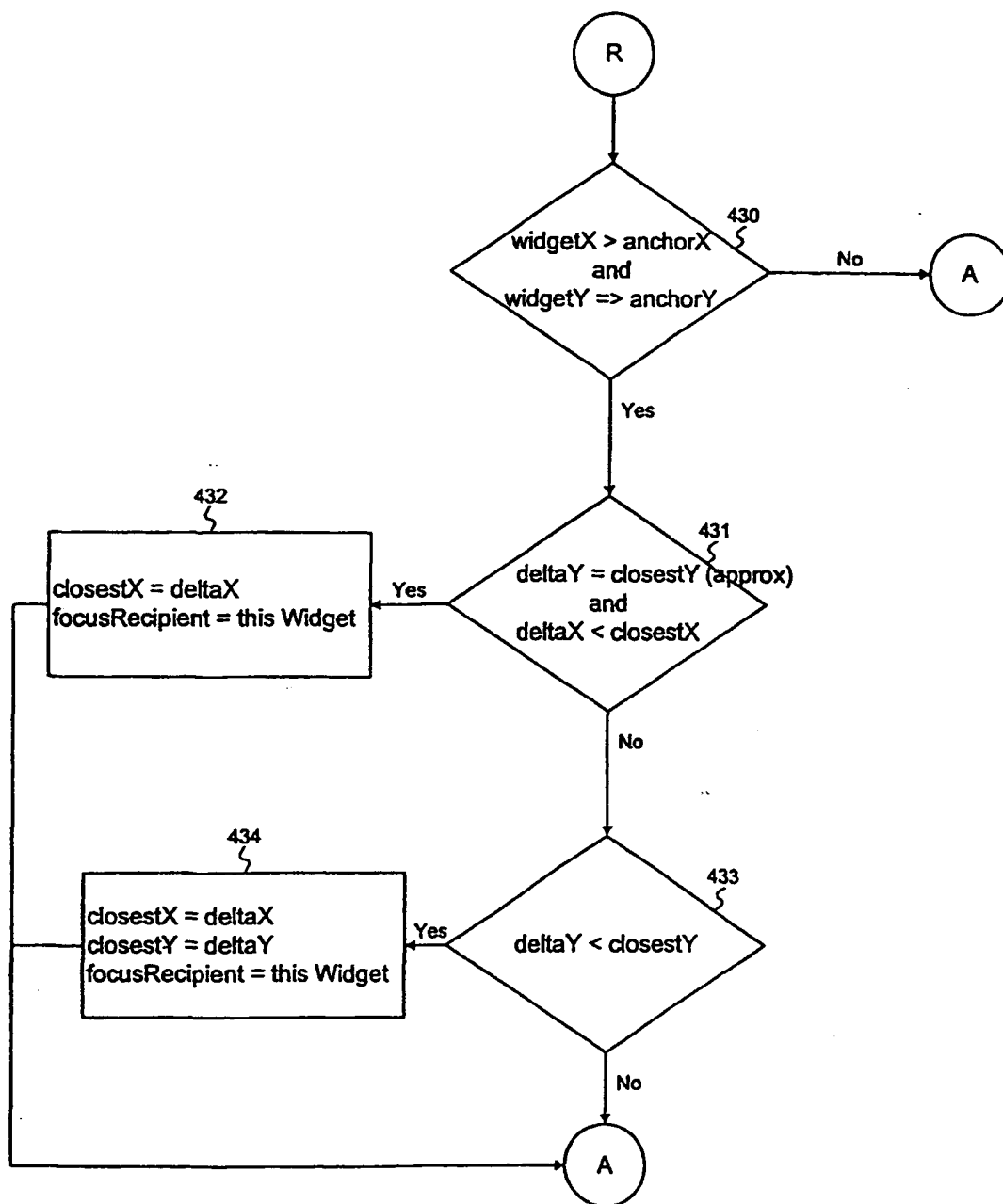


FIG. 4F



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 99 40 1993

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	<p>"TECHNIQUE TO MOVE FOCUS IN PRESENTATION MANAGER APPLICATIONS"</p> <p>IBM TECHNICAL DISCLOSURE BULLETIN, US, IBM CORP. NEW YORK,</p> <p>vol. 34, no. 11, page 278-279 XP000303262</p> <p>ISSN: 0018-8689</p> <p>* the whole document *</p> <p>-----</p>	1-24	G06F9/44
			<p>TECHNICAL FIELDS SEARCHED (Int.Cl.7)</p> <p>G06F</p>
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		14 December 1999	Brandt, J
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p> <p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>			

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